NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE SPECIFICATION

TREE AND SHRUB ESTABLISHMENT

(Acre)

CODE 612

GENERAL SPECIFICATION

Procedures, technical details and other information listed below provide additional guidance for carrying out selected components. This material supplements the criteria and considerations listed in the conservation practice standard.

CRITERIA

General Criteria Applicable To All Purposes

On forest and woodlands in Colorado, Colorado State Forest Service provides technical assistance through local district foresters. Tree and Shrub Establishment is usually an integral component of a forest and woodland management plan. Always check with the local district forester when making site-specific specifications on forestland.

Species will be adapted to soil-site conditions.

Species will be suitable for the planned purpose(s).

Planting or seeding rates will be adequate to accomplish the planned purpose(s).

Planting dates, and care in handling and planting of seed or seedlings will ensure that planted materials have an acceptable rate of survival.

Only viable, high quality, and adapted-trees, shrubs, seedlings, cuttings, or seed will be used.

Site preparation shall be sufficient for establishment and growth of selected species.

Adequate seed or advanced reproduction needs to be present or provided for when using natural regeneration to establish a stand.

Timing and use of planting equipment will be appropriate for the site, soil moisture and other soil considerations.

Each site will be evaluated to determine if mulching, supplemental water or other cultural treatments will be needed to assure adequate survival and growth.

The acceptability of coppice regeneration shall be based on species, age, and diameter.

The planting will be protected from unacceptable adverse impacts from pests, wildlife, livestock damage or fire.

All practices and procedures that involve ground-disturbing activities will be in compliance with applicable cultural resource protection laws, regulations, and policies.

All activities under this practice will comply with applicable laws and regulations.

Additional Criteria For Maintaining Or Restoring Natural Genetic Diversity.

Species selected will be indigenous to the site and will reflect species components of the desired stands.

CONSIDERATIONS

When underplanting, trees should be planted sufficiently in advance of overstory removal to ensure full establishment.

Plans for landscape and beautification plantings should consider foliage color, color and season of flowering, and mature plant height.

Where multiple species are available to accomplish the objective, consideration should be given to selecting species which best meet wildlife needs.

Tree arrangement and spacing should allow for access lanes.

Residual chemical carryover should be considered prior to planting.

CONSIDERATIONS ON PLANT QUALITY.

Plant adapted species as indicated by the soil-woodland correlation or windbreak suitability guide. If those references are not available select species that occur naturally on sites with the same soil series.

For best results, plant only stock grown from a local seed source (seed collected within 100 miles radius of planting site and differing not more than 1,000 feet in elevation).

If a local seed source is not available, use stock from areas having the same length of growing season, the same mean temperature during the growing season, the same pattern and quantity of precipitation, the same latitude, and a similar environment.

All planting stock should be purchased from nurseries that are known to be using adapted seed, seedlings or cuttings. Priority will be given to plant materials that have been selected and tested in tree improvement programs. All plant materials should comply with the minimum standards established by the American Nursery and Landscape Association, 1250 I Street Northwest, Suite 500, Washington, DC.

Plant materials should be ordered as early as possible In order to have the best selection, insure availability, and be cost effective.

CONSIDERATIONS ON PLANTING DENSITIES FOR WINDBREAKS, WILDLIFE HABITAT AND RIPARIAN FOREST BUFFERS.

Initial plant-to-plant densities for trees and shrubs will depend on their potential height at 20 years of age. Heights may be estimated based on: 1) performance of the individual species (or comparable species) in nearby areas on similar sites, or 2) predetermined and documented heights using Windbreak Suitability Groups, Section II of the Field Office Technical Guide. Planting density specifications to achieve %100 canopy cover are:

Plant Types/Heights:	Plant-to-Plant Spacing in feet:
• Shrubs less than 10 feet in height	3 to 8
• Shrubs and trees from 10 to 25 feet in height (includes columnar trees)	6 to 10
• Trees greater than 25 feet in height	8 to 18

CONSIDERATIONS ON CARE AND HANDLING OF PLANTING STOCK.

Planting stock will be stored in a cool, moist environment (34-38 degrees F) or heeled in for long term storage. During all stages of handling and storage, keep stock tops dry and free of mold and roots moist and cool. Destroy stock that has been allowed to dry, to heat up in storage (e.g., within a bale, delivery carton or container), or that has developed mold or other pests. Live cuttings that will not be immediately planted shall be promptly placed in controlled storage conditions (34-38 degrees F) and protected until planting time.

For cuttings, the selected material must be vigorously growing. All live cuttings must be taken during the dormant season. Tops should be cut off with apical buds, side branches removed and cut to produce lengths long enough to reach adequate soil moisture required by the individual species during the growing season. Most species suitable for planting of cuttings or poles must be planted to a depth of permanent water or will require temporary water until the root system develops down to permanent water. Tops of collected cuttings may be dipped into latex paint, paraffin or sealing wax to prevent desiccation and to mark the up-end. Dormant cuttings of many species, particularly cottonwood and willows, may be stored with the butt end submerged in water until planting, which must be prior to the buds breaking. At a minimum, the butt end must be kept cool, dark and moist until the stock is planted.

Seedlings shall not be less than 3/16" in caliper at 1" above the root collar. Rooted planting stock must not exceed a 2:1 shoot-to-root ratio. Preferable shoot-to-root ratio for the Colorado environment is 1:1.

Consideration should be given to provide protection to seedlings from wind and/or heat damage by placing snow fence, shingles, or other suitable materials on one or more sides.

Consideration should be given to increasing available moisture by placing mulches or weed barrier fabric around the base of seedlings, and by engineering the site to slope towards seedlings.

Consideration should be given to providing enough water for optimum growth through the use of drip irrigation (Standard 441 - Trickle irrigation) or other methods of irrigation.

Consider tree planting only on those areas where livestock can be managed (Standard 472 – Use Exclusion).

Roots of bare root stock shall be kept moist during planting operations by placing in a water-soil (mud) slurry, peat moss, super-absorbent (e.g., polyacrylamide) slurry or other equivalent material. Rooting medium of container or potted stock shall be kept moist at all times by periodic watering. Pre-treat stored cuttings with several days of soaking just prior to planting. Stock shall not be planted when the soil is frozen or dry.

CONSIDERATIONS ON PLANTING TECHNIQUES.

Rooted stock will be planted in a vertical position with the root collars approximately 1/2-inch below the soil surface. Insert cuttings to the depth required to reach adequate soil moisture with at least 2-3 buds above ground. The planting trench or hole must be deep and wide enough to permit roots to spread out and down without J-rooting or L-rooting. After planting of rooted stock or cuttings, pack soil around each plant firmly to eliminate air pockets. See figure 1.

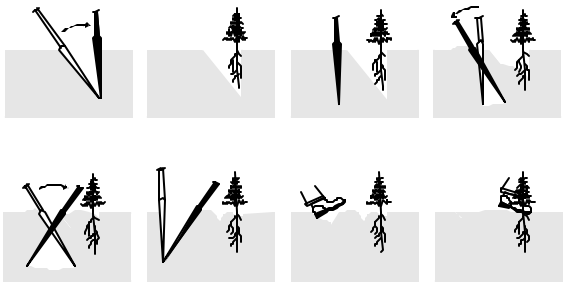

Figure 1. Proper plant and root placement of rooted stock using a planting bar.

Bare root trees will be kept moist at all times before planting by covering with moist burlap or carrying in a pail containing water.

Containerized stock should be kept moist enough that they slip out of the containers and the soil medium remains attached to the roots.

Do not plant on hot windy days.

CONSIDERATIONS ON TREE PLANTING ON FORESTLAND.

Adapted species for forestland reforestation purposes include but are not limited to:

Colorado blue spruce
Douglas-fir
White-fir
Ponderosa pine
Engelmann spruce
Lodgepole pine

Site Preparation will be accomplished prior to planting and will include the elimination of fire hazards in heavy slash areas.

Spacing is an important consideration to assure that all the purposes desired from accomplishing this practice are acquired with the least amount of management inputs.

The number of trees planted per acre is dependent upon soil characteristics, site index of the species to be planted, and whether pre-commercial and commercial thinning activities are planned. See planting rate tables on next page.

When trees are to be grown for harvest as saw logs, a wider spacing may allow trees to grow to merchantable size earlier than when planted closer together. However, there is less allowance for loss. Competing vegetation may not be controlled, and trees may be of lower quality because self-pruning of lower limbs will not occur.

For higher quality timber, manual pruning of lower limbs will be required. Opening the canopy will allow more under story herbage production.

Trees will be planted by hand or with a planting machine.

Plant as early in the spring as possible.

Operation and Maintenance on Forestry Plantations.

Rodents can be managed by a number of methods. Repellents or rodent guards are examples.

Exclude livestock until the planted trees have been in the ground for 3 to 5 years or until the trees are

established enough to withstand minor trampling damage.

Species: Ponderosa pine or Douglas fir Type stock: B=Bareroot C=Container Trees/acre to be planted				
Site Index	Type Stock	Pre-Commerical Thinnings Planned (Min No./Acre)		Sawlog Harvest (Min No./Acre)
50-60	B	640		350
50-60	C	420		295
70-80	B	575		350
70-80	C	370		275
90	B	625		400
90	C	410		265
100+	B	600		350
100+	C	490		225

Species: Engelmann Spruce or Sub Alpine Fir Type stock: B=Bareroot C=Container Trees/acre to be planted			
Site Index	Type Stock		Sawlog Harvest (Min No./Acre)
50-60	B		350
50-60	C		300
60-85	B		300
60-85	C		200
85-100	B		550
85-100	C		400
100+	B		630
100+	C		450

Species: White fir Type stock: B=Bareroot C=Container Trees/acre to be planted			
Site Index	Type Stock		Sawlog Harvest (Min No./Acre)
50 +	B		400
50 +	C		260

- These planting rates are based on 50 percent mortality for bareroot and 30 percent mortality for container seedlings for years 1 and 2.

Replant, as necessary, to maintain a fully stocked stand and achieve all the desired practice goals.

Additional Planning Considerations on forest tree planting:

Tree stock can generally be 1-0, and over 8 inches in total length and vigorous. However, the harsher the site the more important for 2-0, 2-1, or 1-2 stock. The numbering system referred to is the total age of the seedling and where it was grown. Ex. 2-1 refers to the seedling having been grown for 2 years in a green house and then an additional year in an outside planting bed. This is total of three years before having been planted in the plantation or planting.

In species selection, consideration should be given to aesthetic values in scenic corridors.

CONSIDERATIONS ON PLANTING CUTTINGS AND POLES.

For planting of cuttings where no supplemental water is planned, the site must be evaluated for the maximum depth of the water table. Any cutting must be long enough to reach that maximum water table depth and have a minimum of 3 buds above the ground level.

In areas where this exceeds the normal tree planting depth, a hole must be dug for each individual cutting. This is often best accomplished with mechanical means but can be done by hand. In cases where the soil is extremely moist and there is no rock or other impeding layer and the water table is near the surface year round, the cutting can be pushed into the soil to the necessary depth. The entire length of holes dug for cuttings must be filled with soil after planting.

Where supplemental water is provided to cuttings that are not established in a permanent water table, the cuttings must have a minimum of 6 inches in the soil and a minimum of 3 buds above the ground. Cuttings more than 2 feet long will have to have at least 1/3 of the total length in the soil to support the top growth. In Colorado it is optimum to have 2/3 of the cutting in the ground and 1/3 in the air. Supplemental water will be required to provide moisture for the entire depth of the cutting. This may be required for the life of the plant or until the root system can reach the maximum depth of the water table.

CONSIDERATIONS ON PLANTING CUTTINGS FOR RIPARIAN HABITAT PURPOSES.

Adapted species for creation and restoration of riparian habitat using cuttings include but are not limited to:

Cottonwoods - (Narrowleaf, Rio Grande, Plains)
Willows - (Peachleaf, Black, Coyote)

Site preparation and planting considerations for riparian habitat:

See Considerations on Care and Handling of Planting Stock for guidelines.

Spacing is site and species specific.

Maintenance and protection considerations for riparian habitat:

Protect all plantings from grazing and browsing animals as needed to protect planting functions.

Protect the site from fire.

CONSIDERATIONS ON CHRISTMAS TREE SELECTION AND PLANTING.

Adapted Species for Christmas tree plantation purposes include but are not limited to:

Colorado blue spruce	Douglas-fir
Pinyon pine	Ponderosa pine
Engelmann spruce	Scotch pine
White fir	Lodgepole pine
Austrian pine	Subalpine fir

Site preparation should be conducted as follows: prepare the site in the following manner. Plow in late spring followed by a fallow period during the year prior to a spring planting. Disk and harrow immediately before planting as necessary.

In areas that have a preponderance of soils that are not susceptible to wind erosion and that will be irrigated prepare the site in the following manner. Fall plowing prior to a spring in areas that have a preponderance of soils that are not susceptible to wind erosion and that will not be irrigated planting. Disk and harrow immediately before planting as necessary

In areas that have a preponderance of soils that are susceptible to wind erosion prepare the site in the following manner. Treat vegetation with a contact non-residual herbicide the summer before planting or scalp an area 48 inches in diameter free of competing vegetation. Do the scalping in the fall prior to planting.

CONSIDERATIONS ON CHRISTMAS TREE PLANTING AND TREE SPACING.

Christmas trees will be spaced depending on tillage equipment, moisture availability, and markets. Common spacing is 5 feet x 5 feet and 6 feet x 6 feet (for 66 percent taper). The 5 feet x 5 feet spacing allows room for development of a six to eight foot tree. The 6 feet x 6 feet spacing allows for a larger tree. A 4 feet x 4 feet spacing is used when smaller trees are desired or if especially narrow (50 percent or less) taper trees are planned for production.

Number of Christmas trees per acre.

SPACING IN FEET	NUMBER OF STEMS PER ACRE
4 x 4	2,722
5 x 5	1,472
6 x 6	1,210

Christmas tree spacing patterns

Trees may be planted in either a standard grid or an offset pattern. The offset pattern allows for more crown development with a slightly closer spacing between rows (not within the row).

Trees may be planted by hand or with a planting machine.

Operation and Maintenance on Christmas trees:

Clean till within 3 or 4 feet of the seedlings.

Control rodents and deer. Repellents or the installation of rodent and deer proof fences may be required.

Exclude livestock (see Specification' 472 -Livestock Exclusion).

Protect from fire. A firebreak can be constructed around the plantation. Weed management within the plantation will also reduce the fire hazard.

Additional Planning Considerations on Christmas trees:

Replant as necessary and practicable to maintain a fully productive plantation. Preferably, replacement seedlings should be of the same age as the plantation seedlings.

Control noxious weeds prior to planting.

Locate access lanes about 200 feet apart prior to planting.

If irrigation is to be used, have irrigation systems in place before planting. To increase seedling survival, irrigate after planting to aid in packing the soil around the roots and assure enough water to begin growth.

CONSIDERATIONS ON SEEDLING PROTECTION.

On all sites and all plant species that may he subject to unacceptable damage, planning will include preparing estimates of the occurrence of animal populations that have the potential of causing damage. Use of sightings of pocket gopher mounds, animal trails, frequency of scats, and evidence of browsing on native plants will yield data that can help determine the need for plant protection.

On certain sites all species will be subject to unacceptable damage while on other sites no species may he subject to damage and plant protection may not be necessary.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan or other acceptable documentation.

Plans and specifications will include the following: adapted trees for the purposes outlined, spacing, planting methods, cultural practices, and maintenance requirements that are applicable; and variations in methods and species between inter-planting, under-planting, and planting in open areas. Separate specifications can be prepared for each of these planting methods.

OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation) and repair and upkeep of the practice (maintenance):

If needed, competing vegetation will be managed until the woody plants are established.

Replanting will be required when survival is inadequate.

Supplemental water will be provided as needed.

The trees and shrubs will be inspected periodically and protected from adverse impacts including insects, diseases or competing vegetation. The trees or shrubs will also be protected from fire and damage from livestock or wildlife.

Periodic applications of nutrients may be needed to maintain plant vigor.